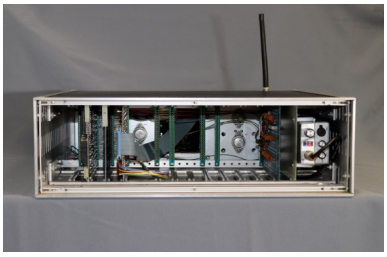
KA6M/R DIGITAL REPEATER HARDWARE

Summary of Photos from February, 2026

The KA6M/R Digital Repeater initiated operation on December 10th 1980 in Menlo Park, California, and was the first to do so in the United States. A paper titled "*On the Care and Feeding of Your Packet Repeater*" published at the time details much of the development and use of the repeater. The launch was recognized in the April, 1981, edition of QST with an article titled "*First Packet Repeater Operational in U.S.*".

I recently took more detailed photos of the hardware and it's interesting to note how technology has developed in the forty-six years since the repeater was built. My notes and comments on the technology and changes follow.

Hank Magnuski, KA6M, 2/15/2026

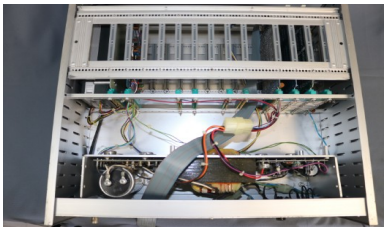


KA6M Repeater – Front View

The repeater electronics were housed in a rack-mountable box measuring 17.5" (44.45 cm) x 5.5" (13.97 cm) x 17.125" (43.5). There was a power supply in the back of the chassis and slots for plug-in circuit boards. Five boards were installed.

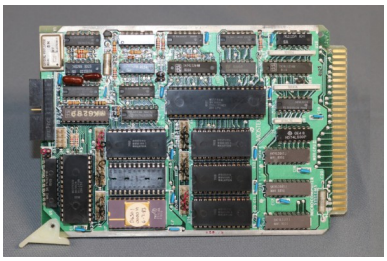
KA6M Repeater – BackView

The back of the repeater had connections for power, digital and analog input-output for the modem, a BNC coax connector for RF and some on/off switches and a reset pushbutton.



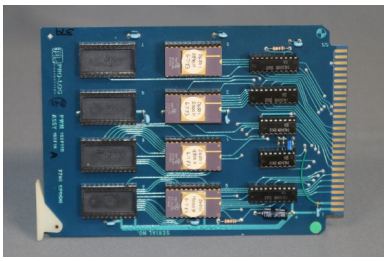
KA6M Repeater – Top View

The power supply was a linear type with a massive transformer and huge capacitors. It was heavy, unlike the switching power supplies used today. Linear supplies, however, radiate much less energy than a typical switcher.



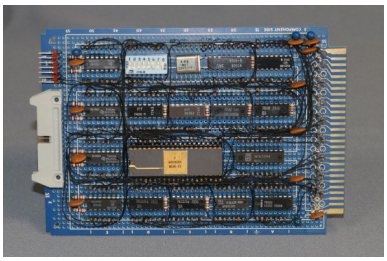
KA6M Repeater – Z80 Board

The Zilog Z80 was an upgrade from the 8080 with more instructions, DRAM refresh and needed only a +5V supply. These are both 8-bit processors. These circuit boards were 6.5” (16.5 cm) x 4.5” (11.43 cm) in size.



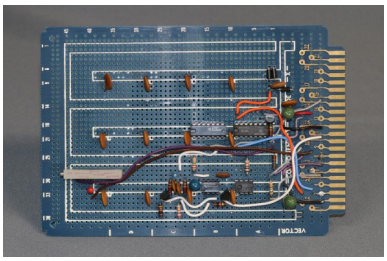
KA6M Repeater – EPROM Memory

This memory board had four TMS-2516 EPROM memory chips, each storing 16,384 bits (yes bits or 2048 bytes of memory). So the whole system ran on 8,192 bytes of code! You’d erase the memory with a strong ultraviolet light and program it with a special burner (taking about 100 seconds).



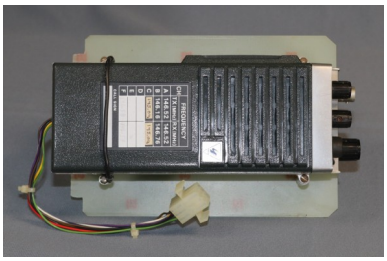
KA6M Repeater – SDLC Board

The introduction of Synchronous Data Link Control (SDLC and later HDLC) was a major state-of-the-art advance in amateur radio communications. SDLC was more efficient over start-stop async, had error detection and was suitable for synchronous modems.



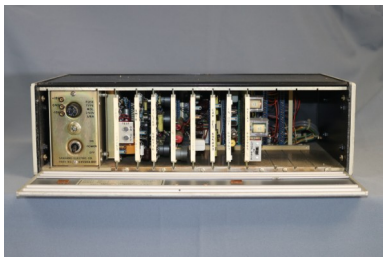
KA6M Repeater – Analog Audio Board

The audio board interfaced between the analog inputs and outputs of the 202 modem and the radio transceiver. The Bell 202 uses 1200 bps AFSK with 1200 Hz for mark and 2200 Hz for space. Although this would be considered slow today, it was a huge advance over 45.5 baud RTTY.



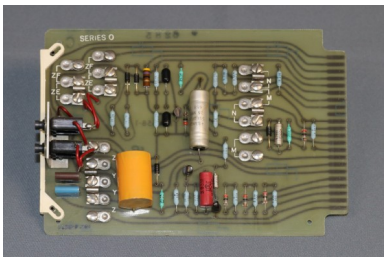
KA6M Repeater – Radio Transceiver

The Yaesu PT202 transceiver (“handy-talkie”) was a simple and inexpensive crystal-controlled radio that worked perfectly for this application. It had six selectable channels and 1-Watt output. The repeater broke new ground by using a single frequency and not requiring expensive duplexers.



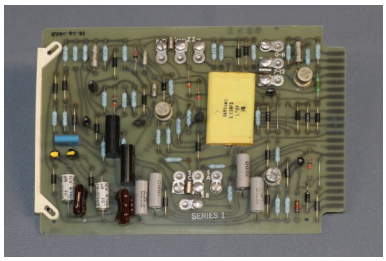
Sangamo T202 Modem

The Bell 202 modem was a 1200 bps AFSK modem designed for use over ordinary telephone lines, and thus was a perfect fit for amateur radio channels. In the late 70's industry was upgrading to 4800 bps and 9600 bps modems and so these units could be easily found on the surplus market.



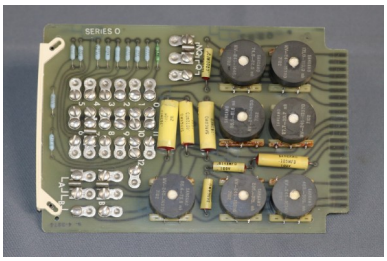
Sangamo T202 Modem – Test Board

The modem had eight circuit boards and a power supply and was 17.75" (45 cm) x 5.00" (12.7 cm) x 9.25" (23.5 cm) in size. Today a DSP chip half the size of a thumbnail could duplicate all this functionality. The test board could configure the modem for receive or transmit or loopback tests.



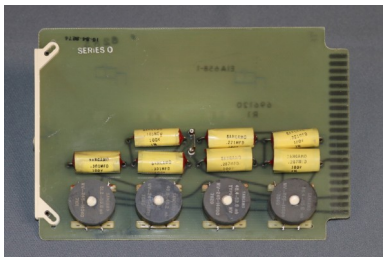
Sangamo T202 Modem – XMTR Board

The XMTR (transmitter) board would generate the 1200 Hz (mark) and 2200 Hz (space) audio tones. These boards were two-layer printed circuits using through-hole components. Each board measured 6.125" (15.55 cm) x 4.5" (11.43 cm).



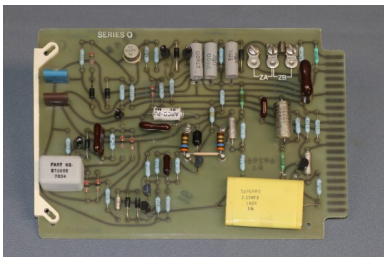
Sangamo T202 Modem – FILTER Board

Filtering insured that the modem output would stay within the voice-frequency bands and not cause cross-talk or splatter into adjacent voice channels.



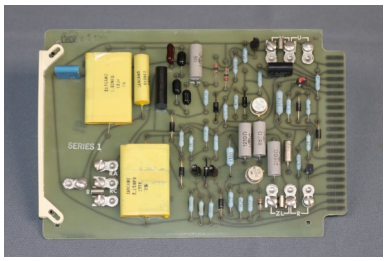
Sangamo T202 Modem – EQUAL Board

The EQUAL (equalizer) board corrects for signal distortion caused by long cables or channel interference, thus improving the SNR and bit error rate.



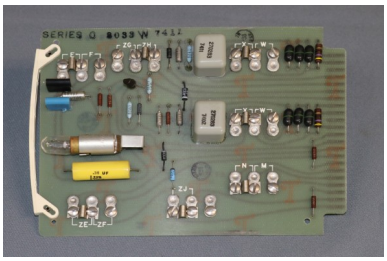
Sangamo T202 Modem – RCVR Board

The RCVR (receiver) board converts incoming AFSK (audio frequency shift keying) tones into digital data.



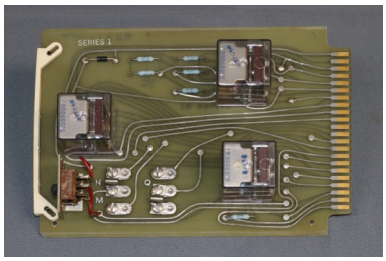
Sangamo T202 Modem – CAR DET Board

The CAR DET (carrier detect) circuit signals when transmitted signal energy is being detected on the channel. This is especially important for simplex use (i.e. packet radio) to avoid transmitting on an already in-use channel.



Sangamo T202 Modem – IN-OUT Board

The IN-OUT (input and output) card receives or sends signals to the outside world. Functions such as electrostatic or surge protection would be implemented on this board.



Sangamo T202 Modem – RELAY Board

The RELAY board could properly connect the modem's inputs and outputs to two-wire (simplex) or four-wire (duplex) channels or to loopback. With loopback the modem could completely test the end-to-end functionality of a circuit.